

PAKISTAN ATOMIC ENERGY COMMISSION
ENTRANCE TEST FOR POST GRADATE TRAINING AT CHASCENT AND KINPOE

SUBJECT: (Sample Paper)

NAME: _____

FATHER'S NAME _____

ROLL No. _____ Email: _____

CENTRE _____ Mobile No. _____

SIGNATURE _____

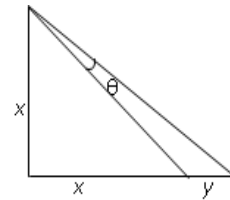
TIME ALLOWED: 02:00 Hours

Instructions:

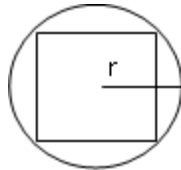
- Write your full name and all other information asked at the top of this page and at the **Answer sheet** provided.
- **Encircle the letters A, B, C or D in the Answer Sheet** corresponding to the correct answer from the given options
- Each correct answer carries **THREE** marks while **ONE** mark will be **deducted** for each incorrect answer.
- Use of any **external paper** for rough work is **not allowed**. Carry out your rough work somewhere in the question paper. **DO NOT** use any side of the answer sheet for rough work.
- **More than one** answers for a single question will be considered as **INCORRECT**
- Fill the answer sheet carefully. Avoid overwriting and/or cutting in the answer sheet.
- **Exchange of any thing is not allowed** during the examination
- **STOP WRITING IMMEDIATELY** when you are asked to do so
- **KEEP YOUR MOBILE PHONES OFF AND POCKETED. USE OF MOBILE PHONE AS CALCULATOR IS ALSO NOT ALLOWED.**
- Be sure that you have got all pages of your paper with 80 questions in all.

1. The Laplace transform of e^{-2t} is
 (A) $0.5/s$ (B) $2/(s+1)$ (C) $1/(s+2)$ (D) $2/(s+2)$
2. $\tan\theta$ in the accompanying diagram is

- (A) $y/(y+2x)$
 (B) $x/(y+x)$
 (C) $y/(y+x)$
 (D) y/x

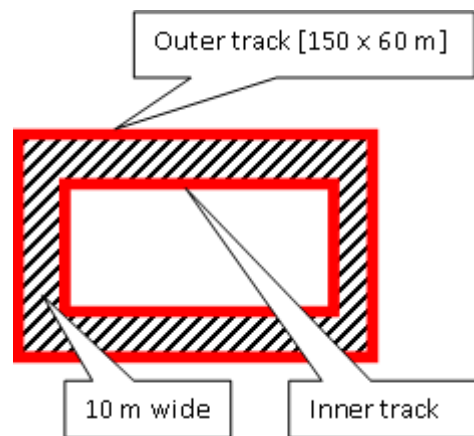


3. The absolute temperature for an ideal gas is
 (A) directly proportional to the rotational K.E. of gas molecules
 (B) directly proportional to vibrational K.E of gas molecules
 (C) directly proportional to average translational K.E of gas molecules
 (D) directly proportional to the P.E of the gas molecules
4. An engineer claims, with some thermodynamic analysis, that if the proposed construction site of a Nuclear power plant is changed from one city to another, Plant efficiency will increase (cost of construction and everything else is same). Does change of city has to do anything with thermodynamic efficiency of plant?
 (A) No
 (B) Yes
 (C) Cannot be determined
 (D) Yes, but only if population difference is negligible
5. By a chord of the curve $y = x^3$ we mean any line joining two distinct points on it. The number of chords which have slope 1 is
 (A) infinite (B) 0 (C) 1 (D) 2
6. A banana has twice the calories than an apple has. Also a hamburger has 1.5 times as many calories as banana. Therefore,
 (A) A hamburger has as many calories as one apple
 (B) A hamburger has 2 times as many calories as one apple
 (C) A hamburger has 3 times as many calories as one apple
 (D) A hamburger has 4 times as many calories as one apple
7. In a uniform circular motion
 (A) both acceleration and speed change
 (B) both acceleration and speed are constant
 (C) both acceleration and velocity are constant
 (D) both acceleration and velocity change
8. A square matrix A is skew Hermitian if
 (A) $A = A^*$ (B) $A^T = -A$ (C) $-A = A^*$ (D) $A^T = A$
9. The absolute pressure inside a system was noted to be 2.5 meters of mercury. Which of the following figures is nearer to the value of this pressure in MegaPascal (MPa)?

- (A) 7.6 (B) 3.3 (C) 1.6 (D) 0.33
10. The average of 2^{16} and 2^{18} is
 (A) 2^{17} (B) $1^{16} + 1^{18}$ (C) $2^{17} + 2^{15}$ (D) $2^{16} + 2^{18}$
11. Three pipes A, B and C can fill a tank in 10, 12 and 15 minutes respectively. First A was opened. After one minute B was opened and after two minutes from the start of A, C was opened. Find the time in which the tank is just full.
 (A) 4 min, 52 sec (B) 3 min (C) 3 min, 52 sec (D) 4 min, 06 sec
12. Zafar is twice as good workman as Fahad. Together they can finish a work in 16 days. In how many days can it be done by each separately?
 (A) 18, 36 (B) 19, 38 (C) 11, 22 (D) 24, 48
13. Which number in the series should come next?
 -1 0 1 8
 (A) 15 (B) 20 (C) 25 (D) 27
14. How much heat is released by 100 gm of water when its temperature decreases from 25°C to 5°C ?
 (A) 9400 J (B) 8400 J (C) 2000 / 4.2 J (D) 84 / 100 J
15. If a square is inscribed in a circle of radius r as shown in figure. The area of square region is
 (A) r^2
 (B) $2r^2$
 (C) πr^2
 (D) $\pi r^2 / 2$
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16. Two ships are 1550 miles apart sailing towards each other. One sails at the rate of 85 miles/day while the other at the rate of 65 miles/day. How apart will they be at the end of 9th day?
 (A) 180 miles (B) 200 miles (C) 220 miles (D) 785 miles
17. Jamil weighs twice as much as Malik. Malik's weight is 60% of Babar's weight. Dawood weighs 50% of Ali's and Ali weighs 90% of Jamil's weight. Which of these 5 persons weighs the least?
 (A) Babar (B) Dawood (C) Ali (D) Malik
18. It takes 30 days to fill a laboratory dish with bacteria. If the size of the bacteria doubles each day, how long did it take for the bacteria to fill one half of dish?
 (A) 15 days (B) $7\frac{1}{2}$ days (C) 29 days (D) $14\frac{1}{2}$ days
19. In a survey of a town of Karachi, it was found that 65% of the people surveyed watched the news on television, 40% read newspaper, and 25% read a newspaper and watched the news on television. What percent of the people surveyed neither watched the news on the television nor read a newspaper?
 (A) 30% (B) 25% (C) 20% (D) 15%
20. If the dimensions of a square are increased by 98%, its area increases by
 (A) 98% (B) 292.04% (C) 329.04% (D) 96.04%
21. Two bodies, one heavier and other lighter, have the same momentum. Which one has greater kinetic energy?

- (A) lighter body (B) heavier body
(C) both have the same kinetic energy (D) not enough data to calculate
22. A sixteen players' squad was announced by cricket council in which a captain, four batsmen and three bowlers were permanent members of the team. How many possibilities are there to select a team of eleven players in such a condition?
(A) 8 (B) 16 (C) 24 (D) 56
23. The pressure P units and the volume $V \text{ m}^3$ of a quantity of gas stored at a constant temperature are related by $pV=k$. At a certain time, the volume of gas in cylinder is 30 m^3 and pressure is 20 units. If the gas is being compressed at the rate of $6 \text{ m}^3/\text{sec}$, at what rate is the pressure changing?
(A) 4 units/s increasing (B) 6 units/s increasing
(C) 6 units/s decreasing (D) 4 units/s decreasing
24. What is the remainder when (x^3+x^2+3x-2) is divided by $(x-1)$?
(A) 1 (B) 2 (C) 3 (D) 4
25. A dense oil is leaking of drum at the 10 cm^3 per second and is expanding in form of a circular disk of 1mm thickness on uniform floor. At what rate will the radius of the circular disc increasing at the moment when exactly 1 litre oil has been leaked out of the drum?
(A) 10 cm/s (B) 56 cm/s (C) 2.8 mm/s (D) 28 mm/s
26. A ground is 150 m long and 60 m wide. All along the border, there is a pavement of 10 m wide on the inner side of the ground. Two rectangular tracks are formed on each side of the pavement. Tow athletes A, and B start running on the outer and inner tracks respectively. How early would the inner runner complete his round than the outer if both of them have a uniform speed of 5 m/s? (neglect the width of the tracks)

- (A) 8 seconds
(B) 16 seconds
(C) 32 seconds
(D) 64 seconds



27. If $x = \log_5 50$, which of the following is true?
(A) $1 < x < 2$ (B) $2 < x < 3$ (C) $3 < x < 4$ (D) $4 < x < 5$
28. What is the summation of first 400 natural numbers?
(A) 60200 (B) 70200 (C) 80200 (D) 90200
29. If $y = x + 2$ and $y = 3x - 1$ be two straight lines, How much far from each other will they cut the y-axis?
(A) 3 units (B) 1 unit (C) $2\frac{1}{2}$ units (D) $1\frac{1}{2}$ units

30. A foot ball is made up of 100 small regular hexagonal pieces of lather having 3.5 cm side lengths when ready and inflated. What would be the approximate circumference of the ball?
- (A) About 71 cm (B) About 11.7 cm (C) About 22.5 cm (D) About 28 cm

CHEMICAL

- The shortest distance between two adjacent tube holes in shell and tube heat exchanger is the
(A) clearance (B) pitch (C) tube spacing (D) none of these
- The maximum angle that can be tolerated in a conical expander without separation is
(A) 7° (B) 12° (C) 15° (D) 20°
- In potential flow, wall drag is
(A) infinite (B) finite and non-zero
(C) zero (D) none of these
- Which of the following is/are example(s) of rotary positive displacement pump(s)?
(A) diaphragm pump (B) vane pump
(C) plunger pump (D) all of these
- Benzene with density (865 kg/m³) and flow rate (9 m³/hr) is pumped from a reservoir to another with suction lift 2m and discharge head 5m. Supposing plug flow, calculate power required if pump efficiency is 80 %.
(A) 15.14 W (B) 18.92 W (C) 12.11 W (D) 20 W
- For circular tube, hydraulic radius is
(A) D (B) D/2 (C) D/3 (D) D/4
- Stokes equation is valid in the Reynolds number range
(A) 0.01 – 0.1 (B) 0.1 – 2 (C) 2 – 10 (D) 10 – 100
- Total integrated drag from pressure is called
(A) wall drag (B) form drag (C) shear drag (D) none of these
- The reaction in which rate equation corresponds to a stoichiometric equation is called
(A) elementary reactions (B) non-elementary reactions
(C) heterogeneous reactions (D) none of these
- The rate expression for the reaction between H₂ and Br₂ to produce HBR (H₂ + Br₂ → HBR) is given by.

$$\text{rate} = \frac{k_1 [\text{H}_2] [\text{Br}_2]^{1/2}}{k_2 + [\text{Br}_2]}$$

The reaction is

- (A) stoichiometric (B) fundamental (C) elementary (D) non-elementary
11. In a CSTR

- (A) reaction rate varies with time (B) concentration varies with time
(C) both (A) and (B) occur (D) neither (A) nor (B) occurs
12. A fluid with viscosity 0.4 Pascal-sec is placed between two plates which are 0.02 m apart. The upper plate is moving with velocity 2 m/s and the lower plate is stationary. Find the velocity at $y=0.015$ if $V=0$ at $y=0$ for linear velocity profile.
(A) 1 m/s (B) 1.5 m/s (C) 2 m/s (D) 1.25 m/s
13. For an autocatalytic reactor, the suitable reactor set up is
(A) P.F. reactors in series (B) CSTR in series
(C) CSTR followed by P.F. reactor (D) P.F. reactor followed by CSTR
14. In a gaseous phase reaction, $A \rightarrow 3B$ is conducted in a constant pressure vessel. Starting with pure A, the volume of the reaction mixture increase 3 times in 6 minutes. The final conversion is
(A) 80% (B) 70% (C) 90% (D) 100%
15. A stagnant liquid film of 0.4 mm thickness is held between two parallel plates. The top plate is maintained at 40°C and the bottom plate is maintained at 30°C . If the thermal conductivity of the liquid is 0.14 W / (m K) , then the steady state heat flux (in W/m^2) assuming one dimensional heat transfer is
(A) 3.5 (B) 35 (C) 3500 (D) 7000
16. The point at which both liquid and gas phases are identical is called
(A) triple point (B) critical point (C) dew point (D) boiling point
17. For an ideal solution, the value of activity coefficient is
(A) 0 (B) < 1 (C) > 1 (D) 1
18. In a working refrigerator value of COP is always
(A) 0 (B) < 0 (C) > 1 (D) < 1
19. One ton of refrigeration capacity is equivalent to
(A) 50 k cal/hr (B) 200 BTU/min (C) 200 BTU/hr (D) 200 BTU/day
20. Coefficient of performance for a reversed Carnot cycle working between temperatures T_1 and T_2 ($T_1 > T_2$) is
(A) $T_2 / (T_1 - T_2)$ (B) $T_1 / (T_1 - T_2)$ (C) $(T_2 - T_1) / T_1$ (D) $(T_1 - T_2) / T_2$
21. Which of the following is / are state equation(s)?
(A) Ideal gas law (B) Virial equation (C) Cubic equations (D) All of these
22. The mostly common used heat exchanger in process industries is
(A) Double pipe (B) Shell & tube (C) Spiral plate (D) None of these
23. Horsepower requirement for given pump capacity depends upon the
(A) specific gravity of the liquid (B) suction lift
(C) discharge head (D) all of these
24. A 35% Na_2SO_4 solution in water is fed to a crystallizer. The product stream contains hydrated crystals $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ in equilibrium with a 20Wt% Na_2SO_4 solution. The feed rate of 35% solution required to provide 500 Kg of hydrated crystals is

- (A) 403 Kg/hr (B) 603 Kg/hr
(C) 803 Kg/hr (D) 1103 Kg/hr
25. The maximum depth from which a centrifugal pump can draw water
(A) dependent on speed N of the pump (B) dependent on the power of the pump
(C) 34 feet (D) 150 feet
26. A 120 cm pipe is in series with a 60 cm pipe. The rate of flow of water in the system of pipes is $2 \text{ m}^3/\text{s}$. What is the velocity of flow in each pipe?
(A) $V_{120} = 2 \text{ m/s}$ and $V_{60} = 6 \text{ m/s}$ (B) $V_{120} = 6 \text{ m/s}$ and $V_{60} = 2 \text{ m/s}$
(C) $V_{120} = 2 \text{ m/s}$ and $V_{60} = 2 \text{ m/s}$ (D) $V_{120} = 1.77 \text{ m/s}$ and $V_{60} = 7.08 \text{ m/s}$
27. The river discharges into a reservoir at a rate of $400,000 \text{ ft}^3/\text{s}$, and outflow rate from the reservoir through the flow passages in the dam is $250,000 \text{ ft}^3/\text{s}$. If the reservoir surface area is 40 square mile, what is the rate of rise of water in the reservoir?
(A) 4 ft/hr (B) 0.484 ft/hr (C) 8 ft/hr (D) 10 ft/hr
28. A tube of outer diameter 5cm and inner diameter 4cm is used to convey hot fluid. The inner surface of the wall of the tube is at a temperature of 80 degree while the outer surface of the wall is at a temperature at 25 degree what is the rate of heat transport across the tube wall per meter length of the tube at steady state ,if the thermal conductivity of the tube wall is $10 \text{ W/(m}\cdot\text{K)}$?
(A) 13823 W/m (B) 15487 W/m (C) 17279 W/m (D) 27646 W/m
29. Velocity correction factor for laminar flow is
(A) 2 (B) 1.5 (C) 1 (D) 1.33
30. Permanent hardness of water is due to the presence of calcium and magnesium
(A) bi-carbonates (B) sulfates and chlorides
(C) carbonate (D) chlorides
31. Molasses is the starting material for
(A) alcohol (B) essential oil (C) fatty acids (D) ether
32. Deaeration of water in its treatment is necessary as it
(A) minimizes its turbidity (B) helps in controlling its taste and odor
(C) minimizes its corrosiveness (D) controls bacteria
33. A double-pipe heat exchanger is to be designed to heat 4 kg/s of a cold feed from 20 to 40°C using a hot stream available at 160°C and a flow rate of 1 kg/s . The two streams have equal specific heat capacities and the overall heat transfer coefficient of the heat exchanger is $640 \text{ W/m}^2\cdot\text{K}$. Then the ratio of the heat transfer areas require for the co-current to counter-current modes of operations is
(A) <1 (B) 1 (C) >1 (D) None of these
34. For laminar flow in a pipe, the Fanning friction factor depends on Reynolds number according to the relation
(A) $f = 24/\text{Re}$ (B) $f = 18.5/\text{Re}$ (C) $f = 16/\text{Re}$ (D) none of these
35. In a certain process, one needs fluid flow in a given direction and the valve is to open or close by the fluid pressure. Which of the following valves permits fluid flow in one direction only?
(A) gate valve (B) globe valve (C) check valve (D) any of these

36. Two plates of equal thickness and cross section are joined together to form a composite. If the thermal conductivity of plates are K and $2K$ then, the effective thermal conductivity of composite is
 (A) $3K/2$ (B) $4K/3$ (C) $3K/4$ (D) $2K/3$
37. When the temperature and humidity of air is low we usually use
 (A) natural draft cooling tower (B) forced draft cooling tower
 (C) induced draft cooling tower (D) none of these
38. Wet bulb and dry bulb temperatures become identical at
 (A) 100% saturation curve (B) 50% saturation curve
 (C) 78% saturation curve (D) none of these
39. Shape factor for a cylinder whose length equals its diameter is
 (A) 0.5 (B) 1 (C) 1.5 (D) 0
40. Soft and non abrasive materials can be made into fines by
 (A) impact (B) attrition (C) compression (D) cutting
41. A fluid energy mill is used for
 (A) cutting (B) crushing (C) ultragrinding (D) None of these
42. Stiffness is a measure of a materials resistance to
 (A) wear (B) bending and buckling
 (C) crack propagation (D) both (A) and (C)
43. Toughness is a measure of a materials resistance to
 (A) wear (B) bending and buckling
 (C) crack propagation (D) none of these
44. Brittle materials are
 (A) weak in tension but strong in compression
 (B) strong in tension but weak in compression
 (C) weak in tension as well as in compression
 (D) strong in tension as well as in compression
45. The liquid phase reaction, $A \rightarrow \text{Products}$ with the kinetics of reaction ($-r_A = 0.1 C_A^2$), is carried out at constant temperature in a CSTR. The CSTR has volume of 75 liters. Pure A is fed to the CSTR at a concentration $C_{A0} = 2 \text{ mol / liters}$ and volumetric flow rate 4 liters /min. Conversion achieved by the CSTR is given
 (A) 40%
 (B) 50%
 (C) 60%
 (D) 80%
46. For a zero order reaction the plot of fractional conversion vs. time is
 (A) a straight line parallel to the time axis (X-axis)
 (B) a straight line passing through the origin
 (C) a straight line which does not pass through origin and is not parallel to time axis
 (D) none of these

47. Carbon block is produced by decomposition of methane $\text{CH}_4(\text{g}) \rightarrow \text{C}(\text{s}) + 2\text{H}_2(\text{g})$.
The single pass conversion of methane is 60% .If fresh feed is pure methane & 25% of methane is exiting the reactor is recycled, then the molar ratio of fresh feed stream to recycle stream is
(A) 0.9 (B) 9 (C) 10 (D) 90
48. A liquid mixture of benzene & toluene is in equilibrium with its vapor at 101kPa & 373K. The vapor pressure of benzene & toluene at 373K are 156 & 63 kPa respectively. Assuming that the system obeys Raoult,s law, the mole fraction of benzene in the liquid phase is
(A) 0.0 (B) 0.04 (C) 0.41 (D) 0.65
49. For a two phase feed, where 80% of the feed is vaporized under column conditions, the feed line slope in McCabe -Thiele method for distillation column design is
(A) $-1/4$ (B) $+1/4$ (C) $+4$ (D) -4
50. In laminar flow through a pipe of radius R, the fraction of total fluid flow through a circular cross section of radius R/2 centered at the pipe axis is
(A) 3/8 (B) 7/16 (C) 1/2 (D) 3/4

Electrical

- In an alternator, the voltage drop occurs in
(A) armature resistance only
(B) armature resistance and leakage reactance only
(C) armature resistance, leakage reactance and armature reactance
(D) armature resistance, leakage reactance, armature reactance and earth connection
- An alternator has full load regulation of 4% when the power factor of the load is 0.8 lagging, and the alternator runs at 1500 rpm. If the same alternator is connected to a prime mover of 1400 rpm, what will be its full load regulation?
(A) 4% (B) $15/14 \times 4\%$ (C) $14/15 \times 4\%$ (D) $(14/15)^2 \times 4\%$
- In a synchronous motor, which of the following losses does not vary with load?
(A) Copper loss (B) Hysteresis loss
(C) Windage loss (D) All of these change with load
- A three phase 440 V, 50 Hz induction motor has a speed of 950 rpm. If the machine has 6 poles, the percent slip would be
(A) 20% (B) 10% (C) 5% (D) $(14/15)^2 \times 4\%$
- A squirrel cage induction motor designed to run at 60 Hz is connected 400V, 50 Hz, 3-phase supply. The rotor will
(A) burn out (B) not start
(C) run at 5/6 of the rated speed (D) run at 6/5 of the rated speed
- A sinusoidal voltage with equation $V_m = \sin 314 t$ is applied across a load and the current lags behind the voltage by 30 degrees. Which of the following is NOT correct?
(A) The load is inductive in nature
(B) No power will be consumed in the circuit
(C) The frequency of the current will be the same as that of the voltage

- (D) Power factor of the circuit will have a value less than 1.0
7. Which of the following is not the function of transformer oil?

(A) Cooling the primary coil	(B) Cooling the secondary coil
(C) Providing additional insulation	(D) Providing inductive coupling
 8. Over voltage transient may occur in a transmission line due to

(A) Lightening	(B) Switching
(C) Arcing ground	(D) Any of the above
 9. Which of the following statements is not correct for a pure inductive circuit?

(A) The power factor of the circuit is zero	(B) The power consumed in the circuit is zero
(C) The instantaneous power in the circuit can have any value positive, negative or zero	
(D) All of the above statements are true for a pure inductive circuit	
 10. A transmitting aerial is radiating un-modulated carrier, the radiated power being 1200 W. If the carrier is now modulated simultaneously by two pure notes to depth of 20% and 40% respectively, the total power radiated will now be

(A) 1320 W	(B) 1200 W	(C) 1180 W	(D) 920 W
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 11. “Current in rotor of an induction machine has the same frequency as the supply”. Which of the following comments is most valid?

(A) The statement is wrong because there is DC in the rotor of an induction machine	(B) The statement is wrong because frequency in rotor is more than supply frequency
(C) The statement is wrong because frequency in rotor is slip times the stator field frequency; normally very smaller compared to supply frequency	
(D) The statement is true	
 12. Machine with a negative slip is

(A) Induction Motor	(B) Brake
(C) Induction Generator	(D) Synchronous machine
 13. An Induction motor is analogous to

(A) DC motor	(B) Transformer
(C) Synchronous motor	(D) DC Generator
 14. Blocked rotor test is analogous to

(A) SC test	(B) OC test	(C) Swinburnes	(D) Load test
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 15. If stator field is rotating in clockwise direction rotor rotates in

(A) any direction	(B) cannot predict	(C) anticlockwise	(D) clockwise
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 16. A resistor has a value of $680\ \Omega$, and you expect it will have to draw 1 mA maximum continuous current. What power rating is best for this application?

(A) $\frac{1}{4}$ W	(B) $\frac{1}{2}$ W	(C) 1 W	(D) 2 W
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 17. Three $3\ \Omega$ resistors are connected to form a triangle. What is the resistance between any two of the corners?

- (A) $\frac{3}{4} \Omega$ (B) 3Ω (C) 2Ω (D) $\frac{4}{3} \Omega$
18. A total current of 352 A is flowing through a circuit having two loads in parallel with resistances of 132 Ohms and 44 ohms respectively. The current in 44 Ohms resistance will be:
 (A) 88 A (B) 264 A (C) 352 A (D) 44 A
19. A standard 60 W bulb is in series with a room heater and connected across the mains. If the 60 W bulb is replaced by 100 W bulb
 (A) The heater output will increase
 (B) The heater output will remain unaltered
 (C) The heater output will decrease
 (D) None of the above is correct
20. The hot resistance of a tungsten lamp is about 10 times the cold resistance. Accordingly, cold resistance of a 100 W, 200 V lamp will be
 (A) 4000Ω (B) 400Ω (C) 40Ω (D) 4Ω
21. Which of the following material can be used as fuse material?
 (A) Silver (B) Copper
 (C) Aluminium (D) Any of the above
22. Which of the following relations for the power factor is incorrect?
 (A) Power factor = Real power / Apparent power
 (B) Power factor = Resistance / Impedance
 (C) Power factor = kW / kVA
 (D) None of the above
23. Voltmeters should generally have:
 (A) Large internal resistance.
 (B) Low internal resistance.
 (C) Maximum possible sensitivity.
 (D) Ability to withstand large currents.
24. The value of inductance necessary to produce resonance at 100 kHz with a capacitance of $0.001 \mu\text{F}$ is
 (A) 25 mH (B) 2.5 mH (C) 0.25 mH (D) 0.025 mH
25. The function of a breather in a transformer is
 (A) To provide oxygen to the cooling oil
 (B) To provide cooling air
 (C) To arrest flow of moisture when outside air enters the transformer
 (D) To filter the transformer oil
26. If excitation current of alternator is decreased then stability of alternator in a Transmission system will
 (A) Increase
 (B) Decrease
 (C) Remain constant
 (D) Excitation is not used in an alternator

27. A short circuit test on a transformer gives
- (A) Copper losses at full load
 - (B) Copper losses at half load
 - (C) Iron losses at any load
 - (D) Sum of iron losses and copper losses
28. If the frequency of the supply voltage is doubled, which of the following losses will increase in a transformer?
- (A) Eddy current loss
 - (B) Hysteresis loss
 - (C) Copper loss
 - (D) None of the above
29. If the e.m.f. in the rotor of a three pole induction motor has a frequency of 1.5 Hz and that in the stator is 50 Hz. What is the speed at which the motor is running?
- (A) 750 rpm
 - (B) 744 rpm
 - (C) 727.5 rpm
 - (D) 713.5 rpm
30. A 3 phase slip ring induction motor has
- (A) Shrot circuited rotor
 - (B) Double cage rotor
 - (C) Wound rotor
 - (D) All of the above
31. Which method of starting an induction motor is expected to take largest starting current.
- (A) Direct on-line starting
 - (B) Stator rotor starting
 - (C) Star-delta starting
 - (D) Auto-transformer starting
32. The back e.m.f. set up in the stator of a synchronous motor will depend upon
- (A) Rotor speed only
 - (B) Rotor excitation only
 - (C) Rotor excitation and rotor speed
 - (D) Coupling angle, rotor speed and excitation
33. An alternator is generating power at 210 V per phase while running at 1500 rpm. If the speed of an alternator drops to 1000 rpm the generated voltage per phase will be
- (A) 180 V
 - (B) 150 V
 - (C) 140 V
 - (D) 105 V
34. The driving power from the prime-mover driving the alternator is lost but the alternator remains connected to the supply network and the field supply also remains on. The alternator will
- (A) Get itself burnt
 - (B) Behave as an induction motor but will rotate in opposite direction
 - (C) Behave as a synchronous motor and will rotate in the same direction
 - (D) Behave as a synchronous motor but will rotate in a reverse direction to that corresponding to generator action

35. The transient voltage that appears across the contacts of a circuit breaker at the instant extinction is called
- (A) Recovery voltage
 - (B) Re-striking voltage
 - (C) Supply voltage
 - (D) Peak voltage
36. As compared to oscillators, an inverter provides
- (A) Low voltage output
 - (B) Low frequency output
 - (C) Distortion loss output
 - (D) Noiseless output
37. One's complement of a binary number can be found out by
- (A) Change all one's to zero's
 - (B) Change all zero's to one's
 - (C) Changing all one's to zero's and all zero's to one's
 - (D) (A) in case of even numbers and (B) in case of odd numbers.
38. Which cell has the reversible chemical reaction?
- (A) Lead acid
 - (B) Mercury oxide
 - (C) Carbon zinc
 - (D) Silver oxide
39. The internal resistance of a dry cell is of the order of
- (A) 0.2 to 0.4 ohm
 - (B) 1 to 1.5 ohm
 - (C) 2 to 5 ohm
 - (D) 1 to 15 ohm
40. The skin effect of a conductor will reduce as the
- (A) Diameter increases
 - (B) Frequency increase
 - (C) Permeability of conductor material increases
 - (D) Resistivity of conductor material increases
41. In overhead transmission lines the effect of capacitance can be neglected when the length of line is:
- (A) More than 300 km
 - (B) More than 200 km
 - (C) Between 150 and 200 km
 - (D) Less than 80 km
42. Corona usually occurs when the electrostatic stress in the air around the conductor exceeds
- (A) 30 kV (maximum value)/ cm
 - (B) 22 kV (maximum value)/ cm
 - (C) 11 kV (maximum value)/ cm
 - (D) 6.6 kV (maximum value)/ cm
43. The bundling of conductors is done primarily to
- (A) Reduce reactance
 - (B) Increase reactance
 - (C) Increase ratio interference

- (D) Reduce ratio interference
44. Under no load conditions the current in a transmission line is due to
- (A) Corona effects
 - (B) Capacitance of the line
 - (C) Back flow from the earth
 - (D) Spinning reserve.
45. The Boolean expression $[A\bar{B}(C + BD) + \bar{A}\bar{B}]C$ is equivalent to
- (A) $A\bar{B}CD$
 - (B) $A\bar{B}C$
 - (C) $\bar{B}C$
 - (D) $\bar{A}C$
46. The main purpose of current limiting in a regulator is
- (A) protection of the regulator from excessive current
 - (B) protection of the load from excessive current
 - (C) To maintain constant out put current
 - (D) to maintain a constant output voltage

CIVIL

1. The No. of independent equations to be satisfied for static equilibrium in a space structure is:
 - (A) 2
 - (B) 3
 - (C) 4
 - (D) 6
2. Typical concrete fails at an ultimate strain of
 - (A) 0.003
 - (B) 0.0035
 - (C) 0.002
 - (D) 0.0025
3. A single rolling load of 8 Kips rolls along a girder of 15 ft span. The absolute maximum bending moment will be
 - (A) 8 Kips-ft
 - (B) 15 Kips-ft
 - (C) 30 Kips-ft
 - (D) 60 Kips-ft
4. The deformation of a spring produced by unit load is called
 - (A) stiffness
 - (B) influence co-efficient
 - (C) unit strain
 - (D) flexibility
5. In a two hinged arch, an increase in temperature induces
 - (A) No bending moment in the arch rib
 - (B) Uniform bending moment in the arch rib
 - (C) Uniform bending moment in the arch rib
 - (D) Minimum bending moment at the crown
6. Poisson's Ratio for Concrete is approximately
 - (A) 0.625
 - (B) 0.534
 - (C) 1.325
 - (D) none of these
7. The field of mechanics concerned with the study of propagation of cracks in materials is known as
 - (A) Statics
 - (B) Dynamics
 - (C) Fracture Mechanics
 - (D) Metal Mechanics
8. Which of the following Test fall in the category of Non-Destructive Testing?

- (A) X-ray (B) Laser Ultrasonics
(C) PT & LT (D) All of these
9. From a nozzle exposed to atmosphere the liquid jet traverses:
(A) Straight path (B) Parabolic path
(C) Circular path (D) Elliptical path
10. Soils exhibit strain-dependent dynamic properties so that as earthquake strong shaking increases, soil shear modulus
(A) increases (B) decreases
(C) remain the same (D) may increase or decrease
11. The damping ratio provides a measure of the soil system's ability to _____ energy under cyclic loading.
(A) dissipate (B) gain (C) dissipate or gain (D) maintain
12. The magnitude of an earthquake is
(A) the measurement of destruction
(B) amount of energy released during the event
(C) equal to the intensity of earthquake
(D) none of these
13. Shear Strength of soil is unique function of
(A) effective stress only (B) total stress only
(C) compaction force (D) both (A) & (B)
14. Westerguard's Analysis for stress distribution beneath loaded areas is applicable to
(A) sandy soils (B) clayey soil (C) stratified soils (D) silty soils
15. Which of the following has an influence on permeability?
(A) void ratio (B) degree of saturation
(C) pressure head (D) grain size
16. The radius of Mohr's Circle for two equal unlike principal stresses of magnitude p is
(A) p (B) $p/2$ (C) $p/4$ (D) zero
17. The variation of bending moment in the portion of a beam carrying linearly varying load is
(A) linear (B) parabolic (C) cubic (D) constant
18. A Cantilever beam AB of length L carries a concentrated load W at its mid-span C. If the free end B is supported on a rigid prop, then there is a point of contra flexure
(A) between A & C (B) between C & B
(C) one between A C and other between C & B (D) at mid-span C
19. A linear arch has
(A) normal thrust only (B) shear Force only
(C) bending moment only (D) normal thrust & shear force
20. The difference in elevation between two edges of the road at the curvature is created by
(A) raising the inner edge (B) raising the outer edge

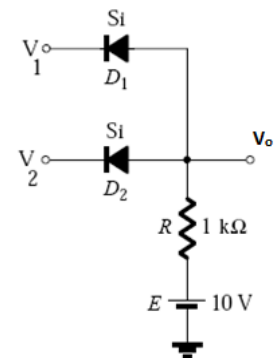
- (C) by raising the centerline (D) All of these
21. A concrete having a slump of 6.5 cm is said to be
(A) dry (B) earth moist (C) semi plastic (D) plastic
 22. Separation of coarse aggregates from mortar during transportation, is known as
(A) bleeding (B) creeping (C) segregation (D) shrinkage
 23. The property by which a body returns to its original shape after removal of the force is known as
(A) plasticity (B) elasticity (C) ductility (D) malleability
 24. The property of a material by which it can be drawn to a smaller section due to tension is known as
(A) plasticity (B) elasticity (C) ductility (D) malleability
 25. The phenomenon of slow extension of materials having constant load i.e. increasing with the time is called
(A) creeping (B) yielding (C) breaking (D) cracking
 26. A steel rod having diameter of 2cm and length 5m is subjected to an axial pull of 3000kg. While $E = 2.1 \times 10^6$, the elongation of the rod will be
(A) 2.275mm (B) 0.2275mm (C) 0.02275mm (D) 2.02275mm
 27. Along the principal plan subjected to maximum principal stress
(A) maximum shear stress acts (B) minimum shear stress acts
(C) no shear acts (D) shear remains medium
 28. The ratio of the tensile stress developed in the walls of a boiler in the circumferential direction to the tensile stress in the axial direction is
(A) 4 (B) 3 (C) 2 (D) 1
 29. The point of contra flexure occurs in
(A) cantilever beam only (B) continuous beam only
(C) overhanging beam only (D) simple beam only
 30. A rectangular beam 20cm wide is subjected to maximum shearing force of 10,000 kg, the corresponding maximum shearing stress being 30 kg/cm^2 . The depth of the beam is
(A) 15 cm (B) 20 cm (C) 25 cm (D) 30 cm
 31. The difference between the time available to do a job and the time required to do the job, is known as
(A) Event (B) Constraint
(C) Duration (D) Float
 32. Seasoning is
(A) a process of removing sap (B) creosoting
(C) painting with sodium silicate (D) coating with tar
 33. In grillage foundations a minimum 15 cm cover is provided on
(A) upper flange of top tier (B) lower beam of lower tier
(C) ends of external beams (D) none of these

34. Half queen close is:
- A brick of normal width and breadth but half thickness
 - A break of half width with standard thickness and length
 - A brick of half length with standard width and thickness
 - A room having half width compared to its length
35. A wall constructed with stones to protect slopes of cuttings in natural ground from the action of weathering agents is called
- retaining wall
 - breast wall
 - buttress
 - parapet wall
36. The slope correction for length of 30m along a gradient of 1 in 20 is
- 3.75 cm
 - 0.375 cm
 - 37.5 cm
 - 2.75 cm
37. Correction per chain length of 100 links along a slope of α radians is
- 100α
 - $100\alpha^2$
 - $100 \alpha^3$
 - $100 \alpha^{-1}$
38. If W is the weight of a retaining wall and P is the horizontal earth pressure, the factor of safety against sliding, is
- 1.0
 - 1.5
 - 2.0
 - 2.5
39. The area of any irregular figure of the plotted map is measured with
- pentagraph
 - sextant
 - clinometer
 - planimeter
40. On an inclined plane, centre of pressure is located
- at the centroid
 - above the centroid
 - below the centroid
 - anywhere
41. A floating body attains stable equilibrium if its metacentre is
- at the centroid
 - above the centroid
 - below the centroid
 - anywhere
42. Equation of continuity of flow is based on the principle of conservation of:
- mass
 - momentum
 - force
 - none of above
43. To a cyclist riding west at 20 km/hr, the rain appears to meet him at an angle of 45° with the vertical. When he rides at 12 km/hr, the rain meets him at an angle of $19^\circ 48'$ with the vertical. The actual direction of the rain is
- 13°
 - 21°
 - 31°
 - 70°
44. For determination of avg. annual precipitation in a catchment basin, the best method is
- arithmetical method
 - Thiessen's mean method
 - isohyetal method
 - none of these
45. The area of a drainage basin, whose axial length is 100 km, is 2500 km^2 . Its form factor is
- 0.10
 - 0.15
 - 0.20
 - 0.25
46. Phytometer method is generally used for the measurement of
- interception
 - evaporation
 - transpiration
 - respiration

47. If the peak discharge of a storm water drain (S.W.Drain) is expected to exceed 150 cumecs, the free board to be provided is
 (A) 100 cm (B) 90 cm (C) 50 cm (D) 50 cm
48. The population of a city in 2000 is 50,000. The average increase per decade of the previous records of population is 5000 and average percentage increase per decade is 20%. The population of the city based on geometrical increase method, in year 2020 will be
 (A) 60,000 (B) 62,000 (C) 70,000 (D) 72,000
49. If a paper moistened with lead acetate for five minutes when placed in manhole turns black, the sewer certainly contains
 (A) hydrogen sulphide (B) carbon dioxide
 (C) methane (D) oxygen
50. For a peak discharge of 0.0157 cumec, with a velocity of 0.9 m/s, the diameter of the sewer main is
 (A) 10 cm (B) 15 cm (C) 20 cm (D) 25 cm

Electronics

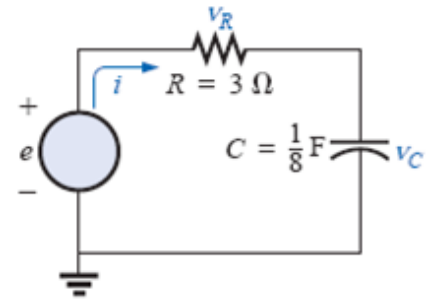
1. A diode that has a negative resistance characteristic is the
 (A) Schottky diode (B) PIN diode
 (C) Laser diode (D) Tunnel diode
2. A given BJT has a beta (β) rating of 400, the value of alpha (α) for this device is;
 (A) 1.0025 (B) 0.0025
 (C) 0.9975 (D) 1.00
3. For positive logic following is an ;



- (A) NAND Gate (B) AND Gate
 (C) OR Gate (D) XOR
4. In a Darlington pair configuration, each transistor has an ac beta of 125. If R_E is 560Ω , the input resistance is;
 (A) 560Ω (B) $70\text{ k}\Omega$
 (C) $140\text{ k}\Omega$ (D) $8.75\text{ M}\Omega$
5. For a certain D-MOSFET, $I_{DSS}=10\text{ mA}$ and $V_{GS(off)}=-8\text{ V}$, value of I_D at $V_{GS}=+3\text{ V}$ will be:
 (A) 18.9 mA (B) 3.91 mA
 (C) 0 mA (D) Can't determine from the information given
6. The maximum efficiency of a class B push-pull amplifier is

- (A) 25% (B) 50%
(C) 79% (D) 98%
7. Which of the following are the three basic sections of a microprocessor unit?
- (A) operand, register, and arithmetic/logic unit (ALU) (B) control and timing, register, and arithmetic/logic unit (ALU)
(C) control and timing, register, and memory (D) arithmetic/logic unit (ALU), memory, and input/output
8. R_{B1} for a silicon PUT (Programmable Uni-Junction Transistor) if it is determined that $\eta = 0.84$, $V_P = 11.2 \text{ V}$, $V_G = 10.5 \text{ V}$, $V_{BB} = 12.25 \text{ V}$ and $R_{B2} = 5 \text{ k}\Omega$ is;
- (A) 12.65 $\text{k}\Omega$ (B) 16.25 $\text{k}\Omega$
(C) 20.00 $\text{k}\Omega$ (D) 26.25 $\text{k}\Omega$
9. When the voltage gain of an amplifier is increased, the bandwidth;
- (A) is not affected (B) decreases
(C) increases (D) becomes distorted
10. Exceeding the Op-amp Slew Rate (SR) results in;
- (A) Improved gain and reduced distortion (B) Increased power and reduced distortion
(C) Reduced distortion and increased bandwidth (D) Clipping and increased distortion
11. If $A_{V(d)} = 3500$ and $A_{CM} = 0.35$, the CMRR is
- (A) 1225 dB (B) 10000 dB
(C) 80 dB (D) 0.0001 dB
12. For a step input, the output of an active integrator is;
- (A) a ramp (B) a triangular waveform
(C) a spike (D) a pulse
13. The number of poles in a filter affect the
- (A) voltage gain (B) bandwidth
(C) centre frequency (D) roll-off rate
14. The unit of magnetic charge is
- (A) Amperes (A) Ampere-meter
(C) Ampere-meter square (D) Coulombs
15. A Wein bridge oscillator has $R_1 = R_2 = 220 \text{ K}\Omega$, and $C_1 = C_2 = 250 \text{ pF}$, The frequency of oscillation will be nearly;
- (A) 0.89 KHz (B) 1.89 kHz
(C) 2.89 kHz (D) 3.89 kHz

16. For the network of given figure If $e=12+10\sin 2t$, the current “ i ” flowing through capacitor will be:



- (A) $12 + 8 \sin(2t + 36.87^\circ)$ (B) $6 \sin(2t - 90^\circ)$
 (C) $8 \sin(2t + 36.87^\circ)$ (D) $2 \sin(2t + 53.13^\circ)$

17. To calibrate a pressure transmitter, with a range of 0 psi to 600 psi, to 0.02% of reading accuracy, which of the following test equipment would be best suited for the calibration?

- (A) Precision dial gage. (B) Precision dead weight tester.
 (C) High pressure mercury manometer. (D) Precision air piston.

18. A certain fiber-optic cable has the following characteristics: $n_1 = 1.82$ and $n_2 = 1.73$. What is the value of θ_c ?

- (A) 1.0° (B) 0.95°
 (C) 1.81° (D) 18.1°

19. 8086 is a 16-bit microprocessor having;

- (A) 4 bit data bus (B) 8 bit data bus
 (C) 16 bit data bus (D) 32 bit data bus

20. The total external data memory that can be interfaced to the 8051 is:

- (A) 32K (B) 64K
 (C) 128K (D) 256K

21. The output of an exclusive-OR gate is HIGH if...

- (A) all inputs are LOW (B) all inputs are HIGH
 (C) the inputs are UNEQUAL (D) Even inputs are HIGH

22. A Karnaugh map is a systematic way of reducing expression of

- (A) exclusive NOR (B) sum-of-products
 (C) product-of-sums (D) those with over bars

23. Which of the following series combinations dissipates the most power when connected across a 100 V source?

- (A) One 100 Ω resistor (B) Two 100 Ω resistors
 (C) Three 100 Ω resistors (D) Four 100 Ω resistors

24. If one of the resistors in a parallel circuit is removed, the total resistance;

- (A) Increases (B) Remains the same
 (C) Double (D) Decreases by the value of the removed resistor

25. The Thevenin equivalent voltage (V_{TH}) for a given circuit is found by:

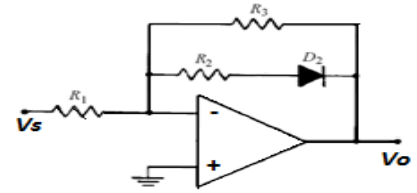
- (A) Shorting the output terminals (B) Opening the output terminals

- (C) Shorting the voltage source (D) Removing the voltage source and replacing it with a short
26. When the voltage across a capacitor is doubled, the stored charge
- (A) Stays the same (B) Is halved
(C) Doubles (D) Increases by four
27. A series RL circuit having $R=2.2\text{ K}\Omega$, $L=100\text{mH}$ connected with $V_S=12\text{V}$, when switch is closed, the value of inductor current I_L after $30\text{ }\mu\text{s}$ will be:
- (A) 2.63mA (B) 5.45mA
(C) None of the above (D) 12mA
28. An inductor and a resistor are in series with a sinusoidal voltage source. The frequency is set so that the inductive reactance is equal to the resistance. If the frequency is increased, then
- (A) $V_L=2V_R$ (B) $V_L=V_R$
(C) $V_L>V_R$ (D) $V_R>V_L$
29. An AC source is transformer-coupled to a load resistor of $100\text{ }\Omega$. The transformer has a turns ratio of 4. The reflected resistance seen by the source is:
- (A) $100\text{ }\Omega$ (B) $25\text{ }\Omega$
(C) $6.25\text{ }\Omega$ (D) $0.04\text{ }\Omega$
30. For a certain load, the true power is 100 W and the reactive power is 100 VAR . The apparent power is:
- (A) 141.4 W (B) 141.4 VA
(C) 100 VA (D) 200 VA
31. To tune a parallel resonant circuit to a lower frequency, the capacitance should be:
- (A) Increased (B) Decreased
(C) Left alone (D) Replaced with inductance
32. In a passive filter, the ratio $V_{\text{out}}/V_{\text{in}}$ is called
- (A) Roll-off (B) Gain
(C) Critical reduction (D) Attenuation
33. In an RC differentiator, the output pulse closely resembles the input pulse when
- (A) τ is much less than the pulse width (B) τ is much larger than the pulse width
(C) τ is equal to the pulse width (D) τ is less than the pulse width
34. If the source phase voltages of Δ -Y system are 220 V , the magnitude of the load voltages is:
- (A) 127 V (B) 220 V
(C) 73.3 V (D) 381 V
35. How will you print `\n` on the screen in "C" language.
- (A) `printf("\n");` (B) `echo "\\n";`
(C) `printf('\n');` (D) `printf("\\n");`
36. Thirteen (13) bits are used for addressing the memory. The last storage address will be
- (A) 8190 (B) 8192

(C) 8191

(D) 8193.

37. The signal-conditioning amplifier of given figure changes gain depending upon the polarity of V_s . If D_2 is ideal, voltage gain for positive V_s is



(A) $-\frac{R_2 * R_3}{R_1(R_2 + R_3)}$

(B) $-\frac{R_3}{R_1}$

(C) $1 + \frac{R_2}{R_1}$

(D) $1 + \frac{R_3}{R_1}$

38. Which control mode is used to eliminate offset?

(A) Derivative

(B) Integral

(C) Proportional

(D) Rate

39. In 8051 which interrupt has highest priority?

(A) EI

(B) TF0

(C) IE0

(D) TF1

40. Z- transform of a unit step function $[u(t)]$ is

(A) $\frac{z}{z-1}$

(B) $\frac{Tz}{(z-1)^2}$

(C) $\frac{T}{(z-1)^2}$

(D) 1

41. Over damped system response results in

(A) An oscillating system

(B) Lengthy settling time

(C) Premature component wear

(D) Ultimate system gain

42. A 3 x 8 decoder with two enable inputs is to be used to address 8 blocks of memory. What will be the size of each memory block when addressed from a sixteen bit bus with two MSBs used to enable the decoder?

(A) 2K

(B) 4K

(C) 16K

(D) 64K

43. In a 16-bit microprocessor, words are stored in two consecutive memory locations. The entire word can be read in one operation provided the first

(A) word is even

(B) word is odd

(C) memory location is odd

(D) memory address is even

44. A SCR (silicon control rectifier) is a _____ kind of transducer

(A) E/I

(B) I/E

(C) I/P

(D) P/E

45. A memory having 256 addresses has

(A) 256 address lines

(B) 6 address lines

(C) 1 address line

(D) 8 address lines

46. To serially shift a byte of data into a shift register, there must be

- (A) one clock pulse (B) one load pulse
(C) eight clock pulses (D) one clock pulse for each 1 in the data

47. The main function of the transport layer is;

- (A) Process-to-process delivery (B) Node-to-node delivery
(C) Synchronization (D) Updating and maintenance of routing tables

48. If the frequency spectrum of a signal has a bandwidth of 500 Hz with the highest frequency at 600 Hz, according to the Nyquist theorem the sampling rate will be:

- (A) 500 samples/s (B) 1200 samples/s
(C) 200 samples/s (D) 1000 samples/s

49. BNC connectors are used by _____ cables.

- (A) Fiber-optic (B) UTP
(C) STP (D) Coaxial

50. What is the hexadecimal equivalent of the Ethernet address 01011010 00010001 01010101 00011000 10101010 00001111?

- (A) 5A-11-55-18-AA-0F (B) 5A-88-AA-18-55-F0
(C) 5A-81-BA-81-AA-0F (D) 5A-18-5A-18-55-0F

Mechanical

1. Thermocouple is suitable for measuring

- (A) liquid temperatures only (B) very high temperatures only
(C) very low temperatures only (D) both high and low temperatures

2. What is $du = C_v dT + \left[T \left(\frac{\partial P}{\partial T} \right)_v - P \right] dv$ for an ideal gas?

- (A) $du = c_v dT - v / R$ (B) $du = c_v dT$
(C) $du = c_v dT - T / P$ (D) none of these

3. Wet bulb and dry bulb temperatures become identical at

- (A) 100% saturation curve (B) 50% saturation curve
(C) 78% saturation curve (D) none of these

4. Working fluids used in refrigeration cycles decrease in temperature as they pass through the throttle valve. The Joule-Thompson coefficient of these fluids is

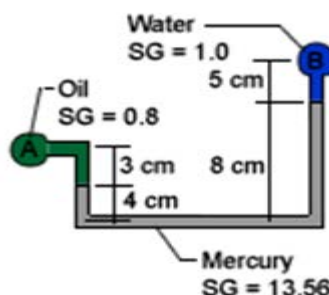
- (A) Negative (B) 0 (C) Positive (D) None of these

5. Five kilogram-mol of octane are burnt with a stoichiometric amount of air. How much water is formed in the products if the combustion is complete?

- (A) 15 kg-mol (B) 25 kg-mol (C) 35 kg-mol (D) 45 kg-mol

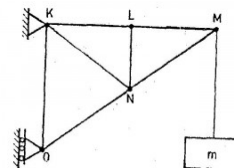
6. The absolute pressure _____ absolute pressure at point B?

- (A) 5.6 kPa
(B) 10.9 kPa



7. In a wind tunnel the flow speeds (of air) on the upper and lower surfaces of the wing of a model airplane are v_1 and v_2 respectively ($v_1 > v_2$). If the wing area is A and the density of air is ρ , the lift on the wing is
 (A) $\rho (v_1^2 - v_2^2)A$ (B) $\frac{1}{2} \rho (v_1 - v_2)A$ (C) $\frac{1}{2} \rho (v_1^2 - v_2^2)A$ (D) $\frac{1}{2} (v_1^2 - v_2^2)A / \rho$
8. Oil has a kinematic viscosity of $1.25 \times 10^{-4} \text{ m}^2/\text{s}$ and a specific gravity of 0.8. What is dynamic (absolute) viscosity of the oil?
 (A) 0.08 kg/m-s (B) 0.10 kg/m-s (C) 0.125 kg/m-s (D) 1 kg/m-s
9. In flow through a straight, smooth pipe, the diameter Reynolds number for transition to turbulence is generally taken to be
 (A) 1500 (B) 2300 (C) 250,000 (D) 4000
10. Consider a liquid with density ρ , viscosity μ and velocity V flowing over a very small dam spillway of length L , such that surface tension coefficient σ is very important. The quantity $\rho V^2 L / \sigma$ in this case is important and is called
 (A) Weber number (B) Froude number
 (C) Prandtl number (D) Bond number
11. Minor losses through pipes, fitting, bend etc. are commonly modeled as proportional to:
 (A) Velocity Head (B) Static Head (C) Total Head (D) Pressure Drop
12. What is hydraulic diameter of rectangular air conditioning duct whose cross section is 1 m by 25 cm?
 (A) 40 cm (B) 50 cm (C) 75 cm (D) 100 cm
13. Stress intensity factor ' K_I ', has the following relationship with the crack length ' a ' in a material
 (A) $K_I \propto a$ (B) $K_I \propto \sqrt{a}$ (C) $K_I \propto \frac{1}{\sqrt{a}}$ (D) $K_I \propto a^2$
14. Annealing of steels is done to
 (A) Remove internal stresses (B) Produce soft core under hard surface
 (C) Produce hard core under soft surface (D) Introduce capacity to withstand shocks
15. Thermal conductivity of solid metals
 (A) Decreases with rise in temperature (B) Does not vary with temperature
 (C) Increases with rise in temperature (D) Remains constant with rise in temperature
16. A shaft made of carbon steel is subjected to a cyclic load. As the # of load cycles increase, the maximum stress the shaft can bear, first decreases and then become stable up to the failure. The lowest stable limit of stress is called
 (A) Ultimate strength (B) Ductile strength
 (C) Sensitization limit (D) Endurance limit
17. The knocking tendency in C.I engines increases with

- (A) decrease of compression ratio
(C) increasing the temperature of inlet air
- (B) increase of compression ratio
(D) increasing cooling water temperature
18. An isentropic process is always
(A) irreversible and adiabatic
(C) frictionless and irreversible
- (B) reversible and isothermal
(D) reversible and adiabatic
19. With the increase in pressure ratio thermal efficiency of a simple gas turbine plant with fixed turbine inlet temperature
(A) decreases
(C) first increases and then decreases
- (B) Increases
(D) first decreases and then increases
20. The air standard Otto cycle comprises
(A) two constant pressure processes and two constant volume processes
(B) two constant pressure and two constant entropy processes
(C) two constant volume processes and two constant entropy processes
(D) none of the above
21. In terms of Poisson's ratio (ν) the ratio of Young's Modulus (E) to Shear Modulus (G) of elastic materials is?
(A) $2(1 + \nu)$
(B) $2(1 - \nu)$
(C) $(1 + \nu)/2$
(D) $(1 - \nu)/2$
22. In the window air conditioner, the expansion device used is
(A) capillary tube
(C) automatic expansion valve
- (B) thermostatic expansion valve
(D) float valve
23. The dynamic load capacity of a 6306 bearing is 22 kN. The maximum radial load it can sustain to operate at 600 rev/min, for 2000 hrs is
(A) 4.16 kN
(B) 3.6 kN
(C) 6.25 kN
(D) 5.29 kN
24. The mechanism of material removal in EDM process is
(A) Melting and Evaporation
(C) Erosion and Cavitation
- (B) Melting and Corrosion
(D) Cavitation and Evaporation
25. The S-N curve for steel becomes asymptotic nearly at
(A) 10^3 cycles
(B) 10^4 cycles
(C) 106 cycles
(D) 10^9 cycles
26. The figure shows a pin-jointed plane truss loaded at the point M by hanging a mass of 100 kg. The member LN of the truss is subjected to a load of?
(A) 0 Newton
(B) 490 Newton in compression
(C) 981 Newton in compression
(D) 981 Newton in tension

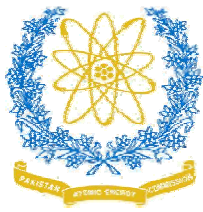


28. The efficiency of vapor power Rankine cycle can be increased by
- Increasing the temperature of the working fluid at which heat is supplied
 - Increasing the pressure of the working fluid at which heat is supplied
 - Decreasing the temperature of the working fluid at which heat is rejected

Which of the above statements is/are correct?

- (A) i alone (B) ii and iii (C) i, ii and iii (D) i and ii
29. A rod of length L and diameter D is subjected to tensile load P . Which of the following is sufficient to calculate the resulting change in diameter?
- (A) Young's Modulus (B) Shear Modulus
(C) Poisson's Ratio (D) Both Young's modulus & Shear modulus
30. For circular tube, hydraulic radius is
- (A) D (B) $D/2$ (C) $D/3$ (D) $D/4$
31. The term regeneration is closely associated with
- (A) Diesel Engine (B) Steam Engine (C) Steam Turbine (D) Gas Engine
32. Ignition quality of diesel fuel is expressed by
- (A) Octane number (B) Cetane Number (C) Carbon percentage (D) Calorific value
33. Toughness of a material is equal to area under which part of the stress-strain curve
- (A) Elastic (B) Plastic
(C) Both elastic and plastic (D) None of these
34. The lowest speed in lathe is adapted for
- (A) Thread cutting Operation (B) Turning Operation
(C) Taper Turning Operation (D) Facing Operation
35. Thermal efficiency of a compression ignition engine is more than spark ignition engine due to its higher
- (A) Speed (B) Indicated Power (C) Torque (D) Compression ratio
36. In an 8-cylinder, V-type compression ignition engine, how many spark plugs are there?
- (A) 4 (B) 8 (C) 16 (D) none of these
37. Which of the following control(s) the power output on different loads for a stationary engine?
- (A) Throttle ONLY (B) Governor ONLY
(C) Clutch ONLY (D) Brake, Throttle and Clutch
38. If the available NPSH for a pump is less than the required NPSH, then
- (A) Flow increases (B) The pump will shut off
(C) Cavitation will be observed (D) Power requirement will decrease
39. Pitot static tube is used for measurement of
- (A) Pressure (B) Flow (C) Discharge (D) Velocity

40. Which of the following fluids has a constant value of viscosity over the whole range of shear stress and viscosity gradient?
- (A) Ideal Fluids (B) Real Fluids
(C) Newtonian Fluids (D) Non Newtonian Fluids
41. Horsepower requirement for given pump capacity depends upon the
- (A) specific gravity of the liquid (B) suction lift
(C) discharge head (D) all of these
42. If some vapors are formed on heat transfer surface, heat transfer will
- (A) Increase (B) Decrease (C) Cease (D) Remain same
43. A ratio of axial strain to transverse strain is called as
- (A) Aspect Ratio (B) Compression Ratio
(C) Golden Ratio (D) Poisson's ratio
44. For a governor running at constant speed, the force acting on the sleeve is
- (A) Zero (B) Constant (C) Variable (D) Maximum
45. How many strokes are required by a double acting steam engine to have one power stroke?
- (A) 1 (B) 2 (C) 4 (D) 8
46. A product is assembled from parts A and B. The probability of parts A and B being defective is 0.1 and 0.2 respectively. What is the probability of assembled product to be non defective?
- (A) 0.7 (B) 0.72 (C) 0.8 (D) 0.85
47. A grinding wheel rotates at 3000 rpm. When power supply is cut off, the wheel stops in 5 sec. The number of revolutions made by the wheel before coming to rest would be
- (A) 1000 (B) 500 (C) 125 (D) 50
48. The process in which change in internal energy of a gas is equal to the work done is known as
- (A) Isochoric Process (B) Isobaric Process
(C) Isothermal Process (D) Adiabatic Process
49. A 10 m long cylindrical bar elongates 0.1 mm under a load. The strain in the bar will be
- (A) 10^{-4} m (B) 10^{-5} m (C) 10^{-2} m (D) 10^6 m
50. Which of the following has the dimensions of ML^2T^{-3} ?
- (A) Eckert Number (B) Schmidt Number
(C) Grashof number (D) None of these
51. A body weighs 30 N and 15 N when weighed under submersed conditions in liquids of relative densities 0.8 and 1.2 respectively. What is the volume of the body?
- (A) 12.5 L (B) 3.82 L (C) 18.70 L (D) 75.50 L



PAKISTAN ATOMIC ENERGY COMMISSION
KINPOE/CHASCENT, JOINT ADMISSION CELL
ANSWER SHEET

Roll Number [Please fill in]				
0	0	0	0	0
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9

INSTRUCTIONS	
1. Use a Black Pointer or Black Marker only.	
2. Please Fill in the Correct Choice very carefully as shown in following example: A B C ●	
3. Each wrong answer carries (-1) negative marking.	
Name _____ Center/City _____	
CNIC No. _____ Program PGTP / PDTP (Tick any one)	
Candidate's Signature _____ Date _____	
Invigilator's Signature _____	

Paper Code [Please fill in]				
0	0	0	0	0
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9

Please Fill the box corresponding to your Field/Technology

Electrical	<input type="radio"/>	Electronics	<input type="radio"/>
Mechanical	<input type="radio"/>	Mechatronics	<input type="radio"/>
Chemical	<input type="radio"/>	Civil	<input type="radio"/>
Computer	<input type="radio"/>	Material/Metallurgy	<input type="radio"/>
M.Sc. [Phy, Chem, Math etc.]	<input type="radio"/>	B. Sc. [Phy, Chem, Math etc.]	<input type="radio"/>
Other (Please Specify)		<input type="radio"/>	

PLEASE CAREFULLY FILL ONE OPTION CORRESPONDING TO EACH QUESTION																			
1	A	B	C	D	21	A	B	C	D	41	A	B	C	D	61	A	B	C	D
2	A	B	C	D	22	A	B	C	D	42	A	B	C	D	62	A	B	C	D
3	A	B	C	D	23	A	B	C	D	43	A	B	C	D	63	A	B	C	D
4	A	B	C	D	24	A	B	C	D	44	A	B	C	D	64	A	B	C	D
5	A	B	C	D	25	A	B	C	D	45	A	B	C	D	65	A	B	C	D
6	A	B	C	D	26	A	B	C	D	46	A	B	C	D	66	A	B	C	D
7	A	B	C	D	27	A	B	C	D	47	A	B	C	D	67	A	B	C	D
8	A	B	C	D	28	A	B	C	D	48	A	B	C	D	68	A	B	C	D
9	A	B	C	D	29	A	B	C	D	49	A	B	C	D	69	A	B	C	D
10	A	B	C	D	30	A	B	C	D	50	A	B	C	D	70	A	B	C	D
11	A	B	C	D	31	A	B	C	D	51	A	B	C	D	71	A	B	C	D
12	A	B	C	D	32	A	B	C	D	52	A	B	C	D	72	A	B	C	D
13	A	B	C	D	33	A	B	C	D	53	A	B	C	D	73	A	B	C	D
14	A	B	C	D	34	A	B	C	D	54	A	B	C	D	74	A	B	C	D
15	A	B	C	D	35	A	B	C	D	55	A	B	C	D	75	A	B	C	D
16	A	B	C	D	36	A	B	C	D	56	A	B	C	D	76	A	B	C	D
17	A	B	C	D	37	A	B	C	D	57	A	B	C	D	77	A	B	C	D
18	A	B	C	D	38	A	B	C	D	58	A	B	C	D	78	A	B	C	D
19	A	B	C	D	39	A	B	C	D	59	A	B	C	D	79	A	B	C	D
20	A	B	C	D	40	A	B	C	D	60	A	B	C	D	80	A	B	C	D
PLEASE DO NOT TURN, FOLD, STAPLE OR DAMAGE THIS SHEET																			